510 General

All plans for contracts, Sundry Sites, Reclamation, and photogrammetric mapping are created using the following established drafting standards. These standards apply to manually drafted plans and those prepared on Computer Aided Drafting and Design (CADD) equipment. Adherence to these standards is essential to ensure the uniformity of plans produced throughout the state.

520 Standards and Symbols

Division 5 (*Standard Symbols and Conventions*) includes the lines, patterns, and the symbols, commonly used in drafting plans. Division 5 also lists CADD cell names, the CADD line weight, CADD line code, CADD level, and CADD line color where applicable. The various geometric and design features that make up plans have been assigned to the 63 different CADD levels. Division 5 is arranged in level order, where all items are listed under the applicable level. These symbols and conventions are available to the CADD operator in the WAESTATE.CEL library.

CADD font 50 will be used for all text on PS&E plans, photogrammetric maps prepared on CADD with the exception that font 42 will be used where a shadow template would normally be used. An exception to the use of font 50 would be for small areas of a plan, i.e., roadway width text, distance ties, etc., where font 50 would be too large. Font 2 shall be used in these cases.

530 WAESTATE.CEL Library (CADD)

The most commonly used symbols, notes, legends, and patterns for CADD plan preparation are contained in the WAESTATE.CEL library. These conventions are located on specific CADD LEVELS.

The current WSDOT CADD workspace is set up so that the libraries will attach as the user logs into the system, they will always have the current library and all the changes as long as they use this configuration.

540 WAEDETAILS.CEL Library (CADD)

Commonly used details, which have been reviewed for compliance with department standards are contained in this library. The details have been drafted in a generic form and queued with question marks. The queues are to be edited using the information that fits the specific project design. These details may also be modified by the user to fit conditions not covered by the details in this library. Examples of details in the WAEDETAIL.CEL library are shown in Division 5-2 and CADD operators should become familiar with the details available.

550 Revision Process to CADD Standard/Procedures

This revision process provides the opportunity for department-wide participation in the development, review, and implementation of new procedures and standards to be used in plan preparation. This process may also be used to improve or revise existing procedures and standards.

This division outlines this process in the form of a flow diagram, prior to symbol listing. Once an idea has been developed to the satisfaction of the originator's work unit (e.g., region plans office, etc.), this process is used to share the idea statewide and implement it as a standard procedure. All changes and revisions MUST still be approved through Headquarters CAE and Headquarters Project Development.

The Headquarters CAE and Headquarters Project Development manage the contents of the WAESTATE.CEL, WAMSTATE.CEL, WAEDETAIL.CEL and WAMDETAIL.CEL libraries. Any questions concerning its contents, suggested changes, or additions should be addressed through the Headquarters CAE and to the Headquarters Project Development Office.
Although this division specifically references CADD, this procedure may be used to share other ideas relating to plan preparation.

560 Design File Guidelines for CADD Operators

560.01 General
This chapter specifically addresses the CADD standards and procedures used to prepare the contract, sundry site, and PS&E. Plans should be representative of those shown in this manual. Drafting should be neat and clear so there is no question as to the presentation. A review of half-size sheets is recommended to find drafting flaws (a contractor reads contract plans at this size). Common drafting problems found are: text placed on top of other text, text placed on top of lines, leader lines that cross (not definitive), and lines that extend beyond match lines.

560.02 Creating a New File Name
Design files have the extension of .DGN, cell libraries have .CEL extensions.

Seed File
The seed file used by WSDOT for creating new design files contains the working units, global origin, and attributes required for department plans. The seed file used to create new design files is ESEED.DGN.

Working Units
The MicroStation working units for WSDOT V8 PS&E and Right of Way CADD files are to include the following working units parameters:

Master Units:	FT
Sub Units:	TH
Sub Units per Master Unit:	1000
Positional Units per Sub Unit:	1
Working Area	1,705,908,950 miles square

The global origin is located at the lower left corner of the design plane (GO=0,0), where XY=0,0. The graphic elements can be placed accurately to the nearest 1/1000th of a foot respectively.

560.03 File Documentation

Why Have It
No one likes having to "fill out the paperwork," but without it, no one other than the creator of the file would have any idea of how the file was constructed or how it related to any other files. Each design file should have a file documentation sheet, located in Plot Location 30, to be filled out at the creation of a new file. It is the responsibility of the user creating this new file to initially fill out the sheet. Furthermore, it is the responsibility of each CADD user who modifies the file in any way to update the file documentation.

560.04 Levels

What They Are
Levels are like "clear overlays" (see Figure 1). Each design file contains 63 levels each overlaying the other. They are assigned named Level 1 through named Level 63. All of the design information is put on different levels.
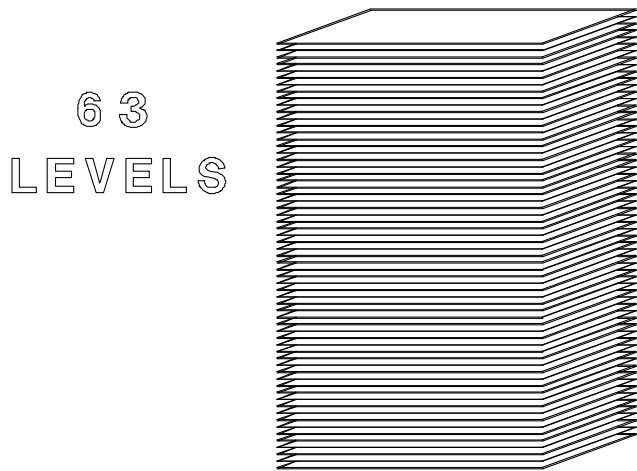

6 3
LEVELS

Figure 1

Information such as proposed highway alignment is drawn on level 28, proposed utilities on level 40 and proposed guardrail on level 42. The operator can produce different types of plans by turning these levels on and off, just like placing different clear overlays together (see example in Figure 2).
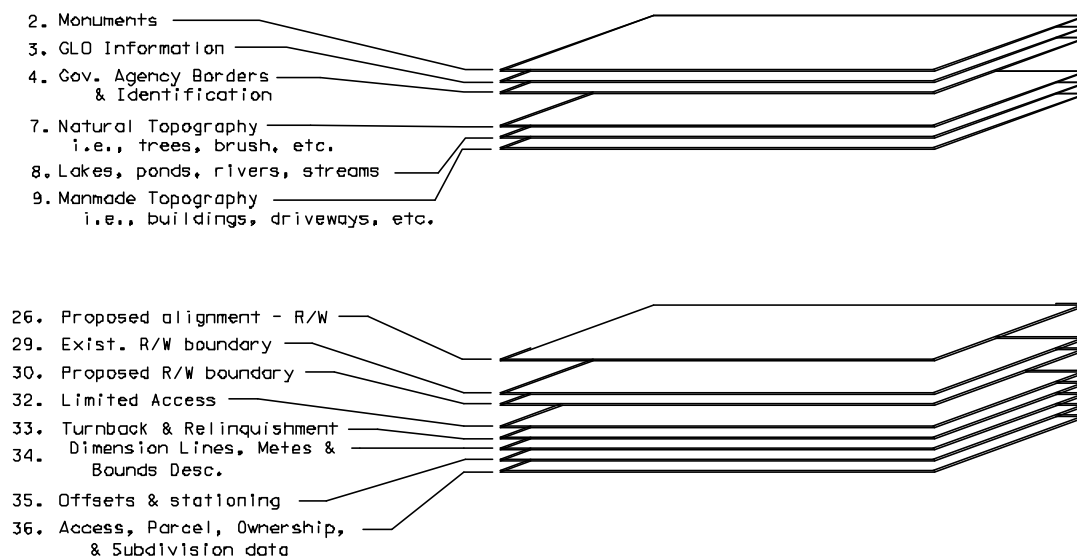
Levels for R/W Plan Sheet

2. Monuments
3. GLO Information
4. Gov. Agency Borders
    & Identification
7. Natural Topography
    i.e., trees, brush, etc.
8. Lakes, ponds, rivers, streams
9. Manmade Topography
    i.e., buildings, driveways, etc.

26. Proposed alignment – R/W
29. Exist. R/W boundary
30. Proposed R/W boundary
32. Limited Access
33. Turnback & Relinquishment
34. Dimension Lines, Metes &
    Bounds Desc.
35. Offsets & stationing
36. Access, Parcel, Ownership,
    & Subdivision data

Figure 2

Use of Unassigned Levels

Occasionally, data must be placed on a level other than those listed in the *Plans Preparation Manual*, Standard Symbols and Conventions. There are a few unassigned levels for this purpose. The operator must make sure that no other information will be in conflict when using these levels.

An example of this would be if the operator needed to break out an intersection from the rest of the alignment to be plotted at a greater scale, and that the line styles, text, and cells were too large to work around. The operator could then assign a copy of these cells, line styles, and text on this breakout at a different scale using an unassigned level. Once placed, the levels of information which were too large could then be turned off.

Setting the Plotting Scale

Before placing data in the newly created design file, the operator must first set the plotting scale to the standard scale of 1"=100' on an 11"x17" sheet. This is done using the WSDOT menu, and selecting **Scale**. The operator then picks the appropriate plotting scale. VB applications use this scale factor when placing some text, cells, and patterns. Not more than one scale factor should be used in any one design file. To maintain compatibility with older files the operator may set the scale to match that of the older files.

560.05 What Goes Where

Sheet Borders

Sheet borders are placed in the design file by use of the **Place Sheet** command selected from the WSDOT **Sheet Items** menu. This command places plan sheets in a reserved area of the design file. A description of this area in coordinate terms would be: (XY=100000,100000 and XY=111150,129075). An automatic plotting macro on the sheet dialog box called **Plot Sheets** recognizes this reserved area and looks there for the requested sheets to plot.

Data for Sheets Only

Data placed directly on the plan sheet should be that which relates to the sheet border alone. Information such as match lines, curve data blocks, scale bars, notes, datum symbols, etc., should be placed within the sheet borders. To further aid in this process, the WSDOT menu has a menu for Base Map items and Sheet file items.

560.06 Reference Files

Reference File Data

Data that relates to the alignment, right of way, etc., should be placed at actual ground coordinates in a design file. All information should be placed where it belongs by coordinates and on the appropriate level.

Fonts/Text

Text is placed in a design file with different fonts or style of text. Standard fonts for use in preparing PS&E and right of way plans are 2, 42, and 50. All others are not standard. It may be necessary to use non-standard fonts to maintain the formatting of information imported from other applications. For example an imported Excel spreadsheet may require certain True Type fonts in order to appear correctly.

Font 50 is to be used for most information. **Font 2** is to be used only in places where font 50 cannot fit (e.g., dimensioning the width of roadway). Most often Font 2 will fit better.

Font 42 is used for names of cities, towns, interchanges, and subdivisions, waterways. Sometimes, other fonts come into the design file from foreign sources. Cartography uses special fonts when preparing Quad Maps. We use these Quad Maps in preparing Vicinity Maps. Even though the fonts are not the same as our standards, there is no need to change them just for a Vicinity Map as long as their appearance is acceptable.

The table below shows the relationship between the plotted size of the text and the size of the text when measured in MicroStation at the sheet location.

<div align="center">

ENGLISH

inches	*feet*
.05	10
.06	12
.07	14
.09	18
.10	20
.125	25
.175	35

</div>

The rule of thumb is that text plotted at (English .05 and .06) must be all capital letters so the contract plans can be read easily. Text plotted at (English .07 or greater) can be upper and lower case letters. Using upper and lower case letters can be of benefit, especially when all capital letters can be used to emphasize something.

Placing Plan Sheets
Figure 3 shows the position of each sheet within the plan sheet placement area. The automated plotting program plots sheets from this reserved area. PLOT30 is reserved in every design file for the File Documentation Sheet.
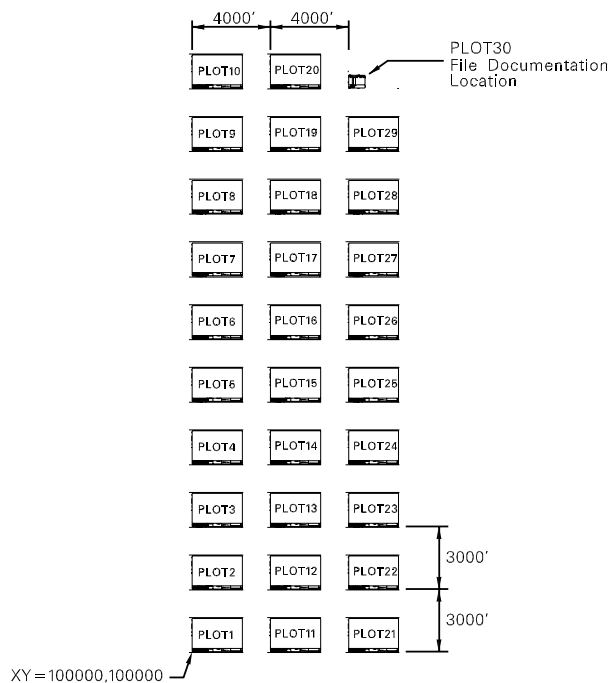

English   Figure 3

Sheets are placed in the proper locations with the **Place Sheets** command found on the Sheet dialog box.

This command brings up the Place Sheets dialog box.

The dialog box has a section with check boxes for each standard sheet location, PLOT1 through PLOT30. There is also a pop-up menu which lists all the available plan sheet types. The user should first pick the type of sheet from this menu. Once this is done the locations for this type of sheet may be selected by clicking on the boxes for the desired sheet locations. To unselect a location, click on that box again. To place the sheets click on the **OK** button. The screen will now show each plan being placed. When the sheets are all placed an alert box will ask, "Do you want to place more sheets?" If more sheets or different styles of sheets are needed the user selects **Yes** and the Place Sheets dialog will reappear allowing other sheets to be placed. The user should select **No** to exit the command.
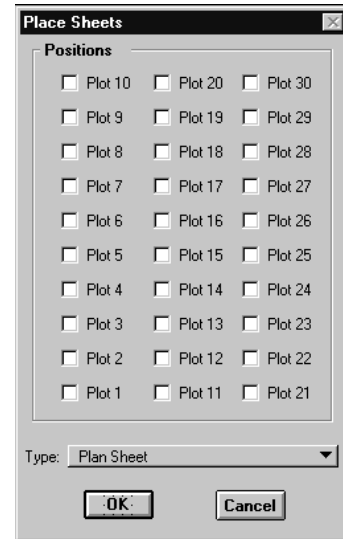
The **Place Sheets** command places the selected sheet cell from the cell library in the correct plot location, places a PLOTx number in the lower right corner of the plan sheet, and saves a view of PLOTx. This is a good time to rename the saved view description to something meaningful, like: PLOT1, R1 Roadway Section.

Saved Views
Saved views are nothing more than saving a "camera" position above the design plane. You can have an infinite number of these cameras, each at different distances from the design plane, and each looking at different levels turned on. You can even rotate the camera for a different rotational view. The view, or "camera" position is then saved using the Saved View dialog box to enter the view name and description.

What is a Reference
A reference is any design file, usually a base plan, which can be attached to the active design file and displayed for reference only and not for modification. A reference attachment can be thought of as a window in the active design file through which portions of the base file can be seen. The entire file may be attached as a "coincidental" reference, which includes the entire design plane. Each coordinate in a coincidental reference, overlays the same coordinate in the active file. Alternatively, and preferably, any saved view stored in the reference may be selected when attaching it to the active design file thus limiting the elements displayed in the reference attachment to those that were visible in the saved view. A reference attachment created from a saved view can be scaled and moved anywhere in the active file as it does not extend to the limits of the design plane.

560.07 Naming Conventions

SAVED View Names
The view name should be pertinent to the type of plan it will be used for, i.e. PAVE01 for a paving plan, Drain01 for a drainage plan and so on. Placing a zero before a single digit will organize the saved views. The description of the saved view should always be the station limits of the plan sheet. Remember, other operators may be using this file at some other time.

Logical Names
Logical names are those given when attaching a reference to a sheet. The purpose of a logical name is to provide a simple and unique name for use in manipulation of the reference attachment. It also allows you to differentiate between multiple attachments from the same file. Figure 4 shows that file B.DGN (The Base Map file) is referenced to file A.DGN (The Sheet file) 5 times, once for each of 5 sheets. Without unique logical names there would be no way to attach B.DGN (the Base Map) multiple times.
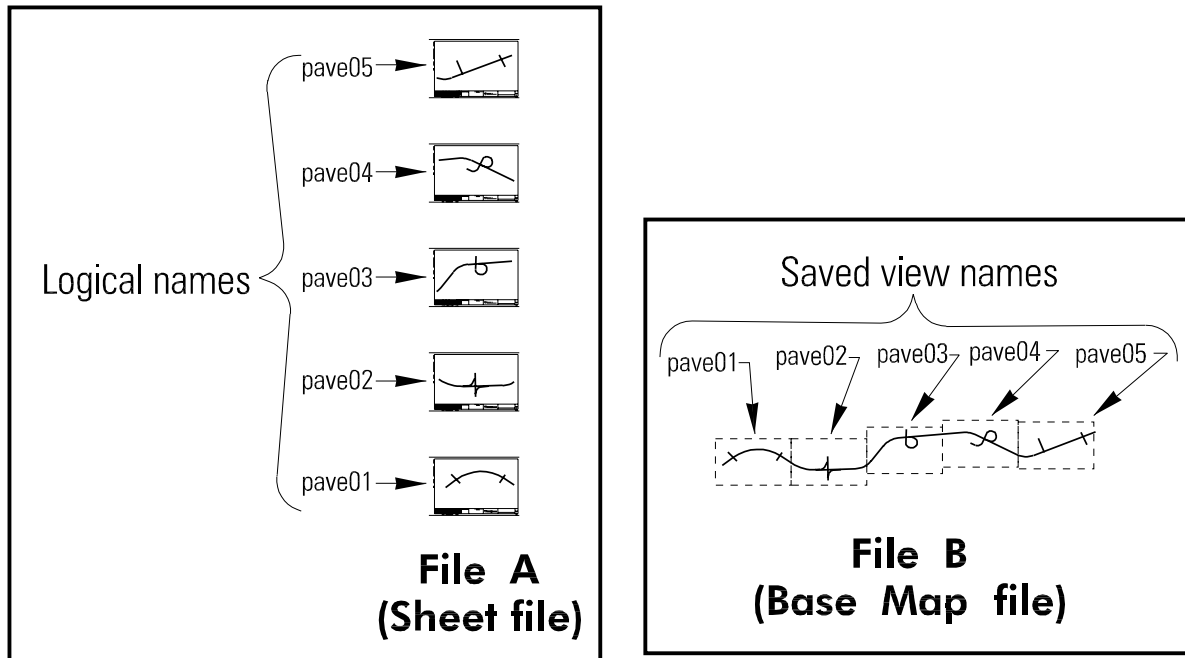

Figure 4

Probably the most important thing to remember about the logical name is to make it the same as the saved view name being used for attachment. If the saved view name is PAVE01 then the logical name should be PAVE01. This makes it easier for the operator to go back and forth between manipulating the reference file on a sheet using the logical name, and going to the reference file, using the saved view name and pulling up the view to manipulate the elements in the reference file.

View Setup

View Rotation
After opening the Base Map file, consider how much the view needs to be rotated. Does the highway run south to north in your design? If so, it must be rotated somewhat to get it to go from left to right across the sheet when attached. Once you have decided how much to rotate the view, rotate it with the Rotate View command.

     Note:
         All rotation must be done in the base plan saved views. Reference files are **never** rotated.

Saving A View
To save the view for attachment, use the **Saved View** dialog box to enter the view name and description. You have now saved a "camera position" for this view.

Note:
> You can set the view back "normal with the world" at any time by selecting the **Rotate View Command > Unrotated**. This returns the view with North being up on the screen.

Attaching
To attach a saved view to a sheet as a reference, bring the desired sheet up on screen. From the **References** toolbox, click on the **Attach Reference** icon. This brings up a dialog box where you can select the file containing the view you wish to attach. Once the file is selected another dialog is displayed which lets you chose the view, set the logical name, add an optional description, and specify the Master: Reference scale factor.

Remember to name the logical the same as the saved view in the reference file.

When you are satisfied with your settings accept them by clicking **OK**. An outline of the saved view which is being referenced will attach to your cursor. Position the outline in the sheet and data point to accept. The reference will now appear. You can use the reference move command to adjust the reference file position on the plan sheet.

The table below gives master: reference scale factors necessary to create plan sheets at the desired sheet scale.

master:ref.	Sheet Scale 11"x17"	Sheet Scale 22"x34"
1:1	1"= 200'	1"= 100'
2:1	1"= 100'	1"= 50'
5:1	1"= 40'	1"= 20'

Reference Levels
The levels turned on in the view saved are those turned on when the view is attached as a reference. If additional levels are required, the operator can turn them on through Level Manager. If additional reference levels are turned on, the operator must go back to the base file, call up the saved view, turn on the additional levels, delete the view, and resave it with the new levels turned on. It is **not necessary** to reattach it to the sheet.

560.08 Clipping

Clip Boundaries
When the view is attached to the sheet, there is usually extra information that is not needed. The clip boundary command trims all of this extra off the sheet. To define a reference clipping boundary (the outside boundary of the displayed area), first place a fence with the **Place Fence** tool. In the list box in the Reference dialog box, select the reference file. From the dialog box's Tools menu, choose **Clip Boundary**. It is best to cut the boundary perpendicular to the roadways at a station that is not marked. The reference file will undraw itself and then redraw itself displaying only the area inside the fence. The limits of the reference file can be expanded in the same way. When expanding the limits it is usually a good idea to place a fence around a much larger area. Fence the desired area and reclip it using the reference file clip boundary command. The reference file clipping limits can be viewed by turning on **Ref Boundaries** in **View Attributes**.

Sheet Title-Strip Data
Each sheet in a set of plans has a title strip along the bottom border. Information found there includes the contract name, sheet type, sheet reference number, sheet number, total number of sheets, federal aid project number, job number, contract number, design team information and PE stamp.

This information is easily entered through the use of the Place Labels macro on the Sheet dialog box. When invoked, a dialog box with fields for each item is presented to the user. The user fills in the desired fields and the selected sheets are updated.

File (Save Settings)
The **Save Settings** command is located in the **File** menu. It allows the operator to preserve settings in a design file between CADD sessions. Settings affected include view attributes, element attributes, active scale, active angle, locks, view arrangement, coordinate readout, etc. When opening a file, the initial state of these settings is the same as those last set while editing the file. If this is a newly created file the settings are those of the seed file used to create it

570 Bridge Site Data turn-in Procedures

570.01 MicroStation Base Map = Bridge Site Data
These steps will direct an operator through the process of turning in data to the Bridge and Structures Office.

- MicroStation Base map **2d only, no 3d files of any kind**
- All base map levels according to Chapter 5 of this manual. This is important for the Bridge software to read your files.
- All levels turned on.
- All reference files merged in and reference file list empty (so Bridge knows that all of the information is there). Contact your Region Coordinator for this procedure.
- Superimpose all Bridge Site Data
- Run deldup and file fixer
- Provide existing and new alignments in the same file.
- Turn in at a scale of 1:1.
- Fill out the documentation sheet for any things that are different or empty levels.
- No data in Caice form – DGN files only.
- Send Caice Output sheets
- Send hard copies – CHANNELIZATION, PROFILES, SUPERELEVATION DIAGRAMS, STAGING & TYPICAL SECTIONS.
- When working with a consultant; all of the above applies. But if the consultant does not use MicroStation and uses AutoCAD; they are permitted to send Bridge Site Data in AutoCAD format (DWG).